Acromag®

IntelliPack Series 832A Alarms
Dual RTD Input

USER'S MANUAL

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Safety Summary - Symbols on equipment:

Means "Caution, refer to this manual for additional information".

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IMPORTANT SAFETY CONSIDERATIONS

It is very important for the user to consider the possible adverse effects of power, wiring, component, sensor, or software failures in designing any type of control or monitoring system. This is especially important where economic property loss or human life is involved. It is important that the user employ satisfactory overall system design. It is agreed between the Buyer and Acromag, that this is the Buyer's responsibility.

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1.0 INTRODUCTION

These instructions cover hardware functionality of the alarm models listed in Table 1. Supplementary sheets are attached for units with special options or features.

Table 1: Model Covered in This Manual

Series/ Input/Type	-Options/Output/ Enclosure/Approvals[1]	-Factory Configuration[2]
832A	-0200	-C

Notes (Table 1):
1. Agency approvals include CE, UL Listed, and cUL Listed.
2. Include the "-C" suffix for optional factory configuration. See Factory Configuration Order Form 8500-587 for this model. No suffix is required for standard configuration.

Module programming, alarm operation, and use of the IntelliPack Configuration Software are covered in the IntelliPack Alarm Configuration Manual (8500-563).

DESCRIPTION

The Series 832A Alarm is another member of the popular Acromag IntelliPack Alarm & Transmitter family. This alarm conditions two RTD inputs and provides two Single-Pole Double-Throw (SPDT) electromechanical relay contacts. These alarms contain an advanced technology microcontroller with integrated downloadable flash memory & EEPROM for non-volatile program, configuration, calibration, and parameter data storage. Units are fully reprogrammable via our user-friendly Windows 95® or NT® IntelliPack Configuration Program. Field reprogrammability without a personal computer is also possible with module push buttons and status LED's. Once configured, these modules may operate independent of a host computer for true embedded monitoring and control.

Each module provides two inputs for RTD signals. Sensor excitation, linearization, lead-wire compensation, and lead break detection are included. The module uses a high resolution, low noise, Sigma-Delta Analog to Digital Converter (Σ-Δ ADC) to accurately convert the input signal into a digitized value. User-defined alarm setpoints are compared to this value and used to control built-in alarm relays. Each relay may have high or low setpoints plus deadband configured. Both the setpoint and deadband may be adjusted over the full input range of the unit. Relay actuation is user-selected for failsafe or non-failsafe operation. Relays may also be configured as latching, in which case a push button reset is required to reset the latch (this may also be accomplished via software control). Additionally, a programmed relay time delay may be applied to filter transients and minimize nuisance alarms. Each relay includes a yellow LED on the front of the module that indicates the high or low alarm condition. A green "Run" and yellow "Status" LED provides local feedback of the operating mode, field configuration status, and system diagnostics. Front panel push buttons are available to reset latched alarm relays and to facilitate field configuration in the absence of a personal computer.

Wide alarm functionality and convenient reprogrammability makes these alarms extremely powerful and flexible over a broad range of applications. These models may be configured as limit alarms, window alarms, on/off controllers, deviation alarms, peak detect alarms, and rate-of-change alarms. Other functions are also possible (consult factory).

All IntelliPack modules are designed to withstand harsh industrial environments. They feature RFI, EMI, ESD, EFT, and surge protection, low temperature drift, wide ambient temperature operation, and isolation from the inputs to power and relay contacts. As wide-range DC-powered devices, these devices may be powered from DC power networks incorporating battery back-up. Additionally, the input power terminal is diode-coupled, providing reverse polarity protection. This allows the unit to be connected to redundant power supplies, or several units to safely share a single DC supply.

Units are DIN-rail mounted and removable terminal blocks facilitate ease of installation or replacement, without having to remove wiring. Alarm relay and power wiring are inserted at one side of the unit, while input wiring is inserted at the other side. Connectors are an industry standard screw clamp type and accept a wide range of wire sizes.

The safe, compact, rugged, reconfigurable, and reliable design of this alarm makes it an ideal choice for control room and field applications. Custom alarm configurations are also available (please consult the factory).

Key IntelliPack 832A Features

- **Agency Approvals** - CE, UL Listed, & cUL Listed.
- **Windows® Configuration** - Fully reconfigurable via our user friendly Windows 95® or NT® Configuration Program.
- **Nonvolatile Reprogrammable Memory** - This module has an advanced technology microcontroller with integrated, non-volatile, downloadable flash memory and EEPROM.
- **Convenient Field Reprogrammability** - The unit includes push-button reconfiguration of key alarm functions in combination with LED indicators to facilitate in-field changes without having to connect a host computer.
- **Wide Alarm Functionality** - This unit may be programmed for a wide range of alarm types including limit, window, on/off controller, deviation, peak detection, or rate-of-change alarms. Other functions are possible (consult factory).
- **Flexible Dual RTD Inputs** - Accepts two channels of RTD inputs for Platinum (Pt), Copper (Cu), and Nickel (Ni) RTD types. Linearization, excitation, and lead break detection are included.
- **True 4-Wire Kelvin Measurement** - Improves performance of 4-wire RTD measurements.
- **High-Power SPDT Relays** - Includes two Single-Pole-Double-Throw (SPDT) electro-mechanical relays for switching voltages up to 230VAC at currents up to 5A.
- **Fully Isolated** - Inputs, power, and relay contacts are all isolated from each other. Dual inputs share a common and do not provide input-to-input isolation.
- **Self-Diagnostics** - Built-in routines operate upon power-up for reliable service, easy maintenance, and troubleshooting.
- **LED Indicators** - A green LED indicates power. A yellow status LED will turn on if the input signal is out of range. A yellow alarm LED indicates relay is in alarm. These LED's also have other functions in field program mode.
- **Wide Ambient Operation** - This alarm is designed for reliable operation over wide ambient temperatures.
- **Wide-Range DC-Powered** - This device receives power over a wide DC supply range and the power terminal is diode-coupled making this alarm useful for systems with redundant supplies and/or battery back-up power.

Key IntelliPack 832A Features…continued

- **Hardened For Harsh Environments** - This alarm will operate reliably in harsh industrial environments and includes protection from RFI, EMI, ESD, EFT, and surges, plus low radiated emissions for CE requirements.
- **Convenient Mounting, Removal, & Replacement** - DIN rail mounting and plug-in type terminal blocks make removal and replacement easy.
- **High-Resolution Precise A/D Conversion** - Alarms include an advanced, high-resolution, low noise, Sigma-Delta Analog to Digital Converter (Σ-Δ ADC) for high accuracy and reliability.
- **Individual Relay Functionality** - Each relay may be programmed for different functions.
- **Failsafe or Non-Failsafe Relay Operation** - The unit may be configured for failsafe or non-failsafe relay operation.
- **Programmable Setpoint With Deadband** - Programmable deadband is associated with each setpoint to eliminate relay "chatter" and prolong contact life.
- **Programmable Latching or Momentary Alarms** - These alarms may be configured for automatic alarm reset, or as latching alarms with manual push-button or software reset.
- **Programmable Relay Time Delay Filters Transients** - Useful for increased noise immunity and to filter transients.

ACCESSORY ITEMS

The following IntelliPack accessories are available from Acromag. Acromag also offers other standard and custom alarm and transmitter types to serve a wide range of applications (please consult the factory).

IntelliPack Configuration Software (Model 5030-881)

IntelliPack alarms and transmitters are configured with this user-friendly Windows 95® or NT® Configuration Program. This software includes the IntelliPack Alarm Configuration Manual (8500-563) and IntelliPack Transmitter Configuration Manual (8500-570). These manuals describe the software operation and various alarm and transmitter functions in detail. All alarm functions are programmable and downloadable to the alarm modules via this software. Non-volatile memory provides program, configuration, and data storage within the IntelliPack.

IntelliPack Serial Port Adapter (Model 5030-913)

The IntelliPack Serial Port Adapter serves as an isolated interface converter between the EIA232 serial port of the host computer and the Serial Peripheral Interface (SPI) port of the IntelliPack module. It is used in conjunction with the Acromag IntelliPack Configuration Software to program and configure the modules. A separate cable is required to connect the adapter to the module. The adapter has a DB9S connector that mates to the DB9P connector typically available at the serial port of the host computer. The adapter also has a 6-wire RJ11 phone jack to connect to the IntelliPack alarm module via an interconnecting cable (described below). The adapter connects to the host computer's EIA232 port and operates transparent to the user. It requires no user adjustment and no external power. It receives its power from the IntelliPack module. Refer to Drawing 4501-635 for computer to IntelliPack connection details.

IntelliPack Cable (Model 5030-902)

This 6-wire cable is used to connect the SPI port of the IntelliPack Serial Port Adapter to the IntelliPack. This cable carries the SPI data and clock signals, reset signal, and +5V power and ground signals. The cable is 7 feet long and has a 6-wire RJ11 plug at both ends which snap into jacks on the Serial Port Adapter and the IntelliPack module.

IntelliPack Interface Package (Model 800C-SIP)

The IntelliPack Interface Package combines the Configuration Software (5030-881), Alarm Configuration Manual (8500-563), Transmitter Configuration Manual (8500-570), Serial Port Adapter (5030-913), and Cable (5030-902), into a complete kit for interfacing with IntelliPack Alarms and Transmitters.

2.0 PREPARATION FOR USE

UNPACKING AND INSPECTION

Upon receipt of this product, inspect the shipping carton for evidence of mishandling during transit. If the shipping carton is badly damaged or water stained, request that the carrier's agent be present when the carton is opened. If the carrier's agent is absent when the carton is opened and the contents of the carton are damaged, keep the carton and packing material for the agent's inspection. For repairs to a product damaged in shipment, refer to the Acromag Service Policy to obtain return instructions. It is suggested that salvageable shipping cartons and packing material be saved for future use in the event the product must be shipped.

CAUTION
SENSITIVE ELECTRONIC DEVICES
DO NOT SHIP OR STORE NEAR STRONG ELECTROSTATIC, ELECTROMAGNETIC, MAGNETIC OR RADIOACTIVE FIELDS

This module is physically protected with packing material and electrically protected with an anti-static bag during shipment. However, it is recommended that the module be visually inspected for evidence of mishandling prior to applying power.

This circuit utilizes static sensitive components and should only be handled at a static-safe workstation.

INSTALLATION

The alarm module is packaged in a general purpose plastic enclosure. Use an auxiliary enclosure to protect the unit in unfavorable environments or vulnerable locations. Stay within the specified operating temperature range for best performance. As shipped from the factory, the unit is factory calibrated for all valid input ranges and has the default configuration shown in Table 2:

WARNING: Applicable IEC Safety Standards may require that this device be mounted within an approved metal enclosure or sub-system, particularly for applications with voltages greater than or equal to 75VDC or 50VAC.

Table 2: 832A Default Factory Configuration

	DEFAULT CONFIGURATION	
PARAMETER	**INPUT 1**	**INPUT 2**
Input	Pt 100Ω (α=1.385)	Pt 100Ω (α=1.385)
RTD Wiring	3-Wire	3-Wire
Temp Units	°C	°C
Sensor Break	Upscale	Upscale
	ALARM 1	**ALARM 2**
Alarm Type	Limit	Limit
Alarm Mode	High Limit	Low limit
Setpoint	200°C	100°C
Deadband	1°C	1°C
	RELAY 1	**RELAY 2**
Time Delay	200ms	200ms
Operating Mode	Failsafe	Failsafe
Reset	Auto (Momentary)	Auto (Momentary)

Your application may differ from the default configuration and the alarm may need to be reconfigured to suit your needs. This is accomplished using Acromag's user-friendly Windows 95® or NT® Configuration Program and Serial Port Adapter. Configuration is normally done prior to field installation since field configurability via the module's push-buttons is generally limited to setpoint and deadband adjustments where applicable. See the Alarm Configuration Manual (8500-563) for instructions.

Mounting: Refer to the Enclosure Dimensions Drawing 4501-631 for mounting and clearance dimensions.

DIN Rail Mounting: The module can be mounted on "T" type DIN rails. Use suitable fastening hardware to secure the DIN rail to the mounting surface. Units may be mounted side-by-side on 1-inch centers for limited space applications.

"T" Rail (35mm), Type EN50022: To attach a module to this style of DIN rail, angle the top of the unit towards the rail and locate the top groove of the adapter over the upper lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove a module, first separate the input terminal block(s) from the bottom side of the module to create a clearance to the DIN mounting area. Next, insert a screwdriver into the lower arm of the DIN rail connector and use it as a lever to force the connector downward until the unit disengages from the DIN rail.

Electrical Connections

Terminal strips can accommodate wire from 14-24 AWG (stranded or solid copper). Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. Input wiring may be shielded or unshielded twisted pair. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. It is recommended that alarm contacts and power wiring be separated from the input signal wiring for safety, as well as for low noise pickup. Note that input, power, and relay terminal blocks are plug-in type and can be easily removed to facilitate module removal or replacement without removing individual wires. Be sure to remove power and/or disable the load before unplugging the terminals to uninstall the module, installing or removing jumpers, or before attempting service. All connections must be made with power removed.

CAUTION: Risk of Electric Shock - More than one disconnect switch may be required to de-energize the equipment before servicing.

1. **Power:** Refer to Electrical Connections Drawing 4501-638. Variations in power supply voltage within rated limits has negligible effect on module accuracy. For supply connections, use No. 14 AWG wires rated for at least 75°C. The power terminal is diode-coupled for reverse polarity protection.

2. **Inputs:** Connect input(s) per Electrical Connections Drawing 4501-638. Observe proper polarity (see label for input type). The dual inputs of this model share common and do not provide input-to-input isolation.

3. **Output Contacts**: Wire relay contacts as shown in Electrical Connections Drawing 4501-638. See the "Alarm Relay Specifications" for power capacity. If necessary, an interposing relay can be used to switch higher currents as shown in Interposing Relay Connection Drawing 4501-634.

   Electromechanical Relay Contact Protection: To maximize relay life with inductive loads, external protection is required. For DC inductive loads, place a diode across the load (1N4006 or equivalent) with cathode to (+) and anode to (-). For AC inductive loads, place a Metal Oxide Varistor (MOV) across the load. See Relay Contact Protection Drawing 4501-627 for details.

   IMPORTANT: Noise and/or jitter on the input signal has the effect of reducing (narrowing) the instrument's deadband and may produce contact chatter. The long term effect of this will reduce the life of mechanical relays. To reduce this undesired effect, you should increase the effective deadband.

5. **Grounding:** See Electrical Connections Drawing 4501-638. The module housing is plastic and does not require an earth ground connection. However, there are mounting positions on the input terminals to connect a cable shield, plus earth ground. These connections are isolated from the input circuit and their use is recommended to minimize noise and help protect the unit from potentially damaging input transients.

   WARNING: For compliance to applicable safety and performance standards, the use of shielded cable is recommended as shown in Drawing 4501-638. Further, the application of earth ground must be in place as shown in Drawing 4501-638. Failure to adhere to sound wiring and grounding practices may compromise safety and performance.

3.0 MODULE CONFIGURATION

The alarm module needs to be configured for your specific application. Alarm configuration is done using Acromag's Windows 95® or NT® Configuration Program and the IntelliPack Serial Port Adapter. Configuration details are covered in Alarm Configuration Manual (8500-563). Limited field configuration via the module's push-buttons and LED's is covered below.

FIELD CONFIGURATION

This program mode allows adjustment to key alarm parameters in the field, without having to connect a host computer. Field reconfigurability is accomplished via the alarm module's "MODE" and "SET" push buttons and LED's (see Drawing 4501-631). Field reconfiguration via these controls will vary depending on the alarm function (see Table 5).

Equipment Required

- An accurate input resistance source (a precision decade box or RTD calibrator) adjustable over the range required for alarm setpoint and dropout (deadband). Two input sources are required for deviation alarms. **Note:** For best results, the input source(s) must be accurate beyond the required specifications.

General Field Programming Procedure

The following procedure uses the corresponding relay LED indicators to indicate which relay parameters (relay 1 or 2) are being modified (see Table 5).

CAUTION: To avoid damage to the unit, do not insert sharp or oversized objects into the push-button switch openings. When depressing the push-buttons, use a blunt tipped object and apply pressure gradually until you feel or hear the tactile response.

1. Connect a precision resistance source to the input, as required (refer to Electrical Connections Drawing 4501-638). For deviation alarms, two input sources are required.
2. Apply power and wait for the module's green "Run" LED to light (continuous ON).
3. Press and hold the **"MODE"** push button until the "Run" LED goes out, and the relay 1 LED lights (see Table 5). In this mode, the unit is ready to accept an input for parameter 1 of relay 1 per Table 3 below. If you do not wish to change this parameter, skip to step 6.
4. Adjust the input source level for relay parameter 1 as shown in Table 3 according to your alarm function (deviation alarms require an adjustment at both inputs).

Table 3: Relay Config Parameter 1 Per Alarm Function

ALARM FUNCTION	PARAMETER 1
Limit Alarm	High or Low Setpoint Level
Window Alarm	High Setpoint Value
On/Off Controller	Controller "On" Setpoint Value
Deviation Alarm (Both Inputs Required)	Set the Deviation Amount (Use Proper Polarity Between Inputs)
Peak/Valley Detector	Peak/Valley Detect Start Value
Rate-of-Change Alarm	Rate-Of-Change Threshold

5. Press the **"SET"** push button to accept the relay 1 parameter indicated in Table 3. Note that every time the **"SET"** button is pressed, the yellow "Status" LED will flash once and the value at the input(s) will be captured.
6. Press the **"MODE"** push button once. The relay 1 LED should start flashing (see Table 5). This means that the unit is ready to accept the second parameter for the relay as shown in Table 4:

General Field Programming Procedure…continued

Table 4: Relay Config Parameter 2 Per Alarm Function

ALARM FUNCTION	PARAMETER 2
Limit Alarm	Setpoint Dropout Level
Window Alarm	Low Setpoint Value
On/Off Controller	Controller "Off" Setpoint Level
Deviation Alarm (Both Inputs Required)	Deviation Dropout Value
Peak/Valley Detector	Peak or Valley Dropout Value
Rate-of-Change	Dropout Rate for Rate-of-Change

7. Adjust the input source(s) to the desired level.
8. Press the **"SET"** push button to accept the parameter noted in Table 4 for your alarm function. The module will use the difference between the two programmed parameters to calculate the deadband where applicable.
9. If two relays are being programmed, Press the **"MODE"** push button again to complete the first relay program cycle and then repeat the above procedure (steps 4-8) to configure parameters for relay 2 (the relay 2 LED will turn ON and the green "Run" LED will still be OFF).
10. After configuring relay 1, and relay 2 (where applicable), press the **"MODE"** push button again to complete the program sequence and return to run mode. The green "Run" LED will turn ON. This indicates that the unit has returned to operating mode and the yellow relay LED's will now reflect actual alarm status per your application.

Notes (Field Program Procedure):

1. If the alarm is in configuration mode and no push buttons are pressed after 2 minutes, then the alarm will return to normal operating mode, the green "Run" LED will light, and no changes will have been completed.
2. Latching alarms require a push button reset to exit the alarm state (this may also be accomplished under software control).
3. Deadband and latching relays have no application with respect to on/off controller functionality.
4. Rate-of-change units (e.g. volts per second) are software configured and cannot be changed in the field via the module's push-buttons.
5. Note that alarm operating functions may be selected on a per relay basis. For example, relay 1 could function as a "limit alarm" monitoring input 1, while relay 2 (if present) functions as an "on/off controller" monitoring input 2. Note that some functions require the use of both inputs of dual input models.
6. During field configuration of dual relay models, the relay LED will be ON or FLASHING, corresponding to the relay being programmed and the parameter being adjusted as in Table 5:

Table 5: Field Configuration Relay LED Mode Indication

ALARM FUNCTION	RELAY 1 or 2 LED	
	ON	FLASHING
Limit	HI/LO Setpoint	HI/LO Dropout
Window	High Setpoint	Low Setpoint
ON/OFF Controller	ON Setpoint	OFF Setpoint
Deviation Alarm	Deviation	Dropout
Peak/Valley Detect	P/V Detect Start	P/V Dropout
Rate-Of-Change	ROC Threshold	ROC Dropout

4.0 THEORY OF OPERATION

Refer to the block diagram of Drawing 4501-627 and functional block diagram 4501-694 to gain a better understanding of the circuit. Note that this alarm uses a calibrated excitation current to convert input resistance to voltage. The voltage signals that represent each leg of the RTD are pre-filtered and multiplexed to the input of a precision A/D converter. The A/D converter stage then applies appropriate gain to the signal, digitally filters it, and performs analog-to-digital conversion. The digitized signal is then transmitted serially to a microprocessor. The microprocessor compares the digitized signal to the limit value according to the alarm type and completes all necessary alarm functions per its embedded program. The program configuration and calibration parameters are stored in non-volatile memory integrated within the microprocessor. Only those functions required by an alarm application are actually stored within memory. A wide input switching regulator (isolated flyback mode) provides isolated +5V power to the circuit.

5.0 SERVICE AND REPAIR

CAUTION: Risk of Electric Shock - More than one disconnect switch may be required to de-energize the equipment before servicing.

SERVICE AND REPAIR ASSISTANCE

This module contains solid-state components and requires no maintenance, except for periodic cleaning and alarm configuration parameter (setpoint, deadband, etc) verification. Since Surface Mounted Technology (SMT) boards are generally difficult to repair, it is highly recommended that a non-functioning module be returned to Acromag for repair. The board can be damaged unless special SMT repair and service tools are used. Further, Acromag has automated test equipment that thoroughly checks and calibrates the performance of each module. Please refer to Acromag's Service Policy Bulletin or contact Acromag for complete details on how to obtain service parts and repair.

PRELIMINARY SERVICE PROCEDURE

Before beginning repair, be sure that all installation and configuration procedures have been followed. The unit routinely performs internal diagnostics following power-up or reset. During this period, all LED's will turn ON momentarily, and the green "Run" LED flashes. If the diagnostics complete successfully, the "Run" LED will stop flashing after two seconds and then remain ON. This indicates that the unit is operating normally. If the "Run" LED continues to flash, then this is indicative of a problem. In this case, use the Acromag IntelliPack Configuration Software to reconfigure the module and this will usually cure the problem. If the diagnostics indicate a problem via a continuously flashing green LED, or if other evidence points to a problem with the unit, an effective and convenient fault diagnosis method is to exchange the questionable module with a known good unit.

The IntelliPack Serial Port Adapter also contains a red LED visible at the small opening in the enclosure to the right of the RJ11 receptacle. If this LED is OFF or Flashing, then a communication interface problem exists. Note that the adapter receives its power from the IntelliPack module. A constant ON LED indicates a properly working and powered serial interface adapter.

Acromag's Application Engineers can provide further technical assistance if required. When needed, complete repair services are available from Acromag.

6.0 SPECIFICATIONS

General: The IntelliPack Model 832A-0200 is a DC-powered alarm which conditions two channels of RTD or resistance input, and provides two Single-Pole Double-Throw (SPDT) electromechanical alarm relays. Isolation is supplied between the input, the relay contacts, and power. This alarm is DIN-rail mounted.

The unit must be wired and configured for the intended input type and range (see Installation Section for details). The unit is configured and calibrated with our user-friendly Windows 95® or NT® IntelliPack Configuration Program. Push-buttons on the module allow field adjustment of setpoint and deadband where applicable. Calibration and configuration information is stored in non-volatile reprogrammable memory within the module. The following paragraphs summarize this model's input types, ranges, and applicable specifications.

MODEL NUMBER DEFINITIONS:

Alarms are color coded with a yellow label. The prefix "8" denotes the IntelliPack Series 800, while the "A" suffix specifies that outputs are alarm contacts.

832A: Monitors two resistance temperature detector (RTD) inputs.

-0200: The four digits of this model suffix represent the following options, respectively:

0 = Options: None (reserved for future use);
2 = Output: Two SPDT relays;
0 = Enclosure: DIN rail mount;
0 = Approvals: Pending (consult factory).

INPUT SPECIFICATIONS

Unit must be wired and configured for the intended input type and range (see Installation Section for details). The following paragraphs summarize this model's input types, ranges, and applicable specifications.

RTD: User configured to one of four RTD types or as a simple resistance input as noted in Table 6 below. The module provides sensor excitation, linearization, lead-wire compensation, and sensor break detection.
Input Reference Test Conditions: Pt RTD 0°C to 100°C, Ni RTD 0°C to 50°C, Cu RTD 0°C to 250°C; Ambient = 25°C; Power Supply = 24V DC; Relay Delay = 200ms.
Input Configuration: Two-wire, three-wire, or four-wire (Kelvin or compensation loop).
Excitation Current: 1mA DC typical, all types.
Linearization: Better than ±0.25°C, typical.
Lead-Wire Compensation: Inherent for 3-wire and 4-wire RTD's. The maximum lead resistance is 25Ω per lead (Pt), 20Ω per lead (Ni), 10Ω per lead (Cu). All lead wires must be of equal size and length.
Lead Resistance Effect: 3.5°C per Ω of unbalance, typical (Pt), 1.4°C per Ω of unbalance, typical (Ni), 25.5°C per Ω of unbalance, typical (Cu),
Break Detection: RTD sensor failure can be configured for upscale or downscale break detection.

Table 6: RTD Types, Ranges, and Accuracy

RTD Type	α Alpha	°C Range	Typical Accuracy
Pt 100Ω	1.3850	-200 to +850°C	±0.25°C
Pt 100Ω	1.3911	-200 to +850°C	±0.25°C
Ni 120Ω	1.6720	- 80 to +320°C	±0.25°C
Cu 10Ω	1.4272	-200 to +260°C	±1.00°C
Resistance (Linear)	1.000	0 to 500Ω	±0.05Ω

Note (Table 6): Alpha (α) is used to identify the particular RTD curve. The value of alpha is derived by dividing the resistance of the sensor at 100°C by the resistance at 0°C ($\alpha = R_{100°C}/R_{0°C}$). For Pt 100Ω, this is 138.5Ω/100.0Ω, or 1.385 (also shown as 0.00385Ω/Ω/°C).

General Input Specifications
Accuracy: Better than ±0.05% of input span, typical. See Table 6.
Accuracy Versus Temperature: Better than ±0.005% of input span per °C, or ±1uV/°C, whichever is greater.
Resolution: See Table 7 below.

Table 7: Resolution Per Applicable Range

Range	Resolution
10Ω Cu (α=1.4272)	0.2°C (0.36°F)
Pt (α=1.3850)	0.1°C (0.18°F)
Pt (α=1.3911)	0.1°C (0.18°F)
Ni (α=1.6720)	0.1°C (0.18°F)
0 to 500Ω	7.8125mΩ

Response Time: Less than 300ms typical to 98% of final value for a step change in input. Note a software configurable delay can be implemented for filtering transients and this will increase the response time.
Input Filter: Normal mode filtering, plus digital filtering, optimized and fixed per input range within the Σ-Δ ADC.
Input Bandwidth: Alarm contacts will track an input square wave to approximately 2Hz. Note that relay time delay can be implemented for filtering transients and this will lower the effective bandwidth.
Noise Rejection (Normal Mode): Better than 40dB @ 60Hz, typical with 100Ω input unbalance (24.9Ω for process currents).
Noise Rejection (Common Mode): Better than 130dB @ 60Hz, typical with 100Ω input unbalance (10Ω unbalance for Cu RTD).
Analog to Digital Converter (A/D): A 16-bit Σ-Δ converter, Analog Devices AD7714AR-5. A/D reference is 1020Ω (1.02V at 1mA).
Input bias current: 1mA DC excitation current.
Input Conversion Rate: 5 conversions per channel per second.

RELAY OUTPUT SPECIFICATIONS

SPDT ALARM OUTPUT (-x2xx): This model contains two independent SPDT electro-mechanical relays. Each relay contains high reliability, Form C (Normally Open and Normally Closed) contacts. One relay is assigned to each input and each relay may have a different operating function.

SPDT Alarm Relay Specifications:

Electrical Life - CSA Ratings:
25VDC, 5A, 10^5 operations, resistive.
48VDC, 0.8A, 10^5 operations, resistive.
240VDC, 0.1A, 10^5 operations, resistive.
120VAC/240VAC, 5A, $3x10^4$ operations, resistive.

Note: To control a higher amperage device, such as a pump, an interposing relay may be used (see Interposing Relay Connections Drawing 4501-634).

Contact Material: Silver-cadmium oxide (AgCdO).

Initial Dielectric Strength: Between open contacts: 1000VAC rms.

Expected Mechanical Life: 20 million operations. Note: External contact protection is required for use with inductive loads (see Contact Protection Drawing 4501-627). Failure to use adequate protection may reduce contact life or damage the unit.

Relay Response (No Relay Time Delay): Relay contacts will switch within 300ms for an input step change from 10% of span on one side of an alarm point to 5% of span on the other side of the alarm point.

ENCLOSURE/PHYSICAL SPECIFICATIONS

See Enclosure Dimensions Drawing 4501-631. Units are packaged in a general purpose plastic enclosure that is DIN rail mountable for flexible, high density (approximately 1" wide per unit) mounting.

Dimensions: Width = 1.05 inch, Height = 4.68 inches, Depth = 4.35 inches.

DIN Rail Mounting (-xx0x): DIN rail mount, Type EN50022; "T" rail (35mm).

Connectors: Removable plug-in type terminal blocks rated for voltages and currents up to 300V and 15A. Wire Range is 14-24 AWG, stranded or solid copper. Separate terminal blocks are provided for each input, power, and relay contacts. For supply connections, use No. 14 AWG copper wires rated for at least 75°C.

Case Material: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Printed Circuit Boards: Military grade FR-4 epoxy glass.

Shipping Weight: 1 pound (0.45 Kg) packed.

APPROVALS (-xxx0)

0: Agency Approvals - CE, UL Listed, and cUL Listed. UL3121 First Edition, CSA C22.2 No. 1010.1-92, Low Voltage Directive (72/23/EEC), EMC (89/336/EEC) Directives.

Product approval is limited to the general safety requirements of the above standards.

Warning: This product is not approved for hazardous location applications.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: -25°C to +70°C (-13°F to +158°F).

Storage Temperature: -40°C to +85°C (-40°F to +185°F).

Relative Humidity: 5 to 95%, non-condensing.

Power Requirements: +10V Minimum to +36V DC Maximum. Current draw is a function of the supply voltage (see Table 8). Current shown assumes that the Serial Port Adapter is connected. An internal diode provides reverse polarity protection.

CAUTION: Do not exceed 36VDC peak, to avoid damage to the module.

Table 8: Supply Current (Model 832A-0200)

Supply Voltage	Supply Current (Relays Off)	Supply Current (Relays On)
10V	60mA	120mA
12V	50mA	100mA
15V	40mA	80mA
24V	30mA	55mA
36V	25mA	40mA

Note: Disconnecting the Serial Port Adapter will reduce current consumption by 15% on average.

Power Supply Effect:

DC Volts: Less than ±0.001% of input span change per volt DC for rated power supply variations.

60/120 Hz Ripple: Less than 0.01% of input span per volt peak-to-peak of power supply ripple.

Isolation: Input, relay contacts, and power are isolated from each other for common-mode voltages up to 250VAC, or 354V DC off DC power ground, on a continuous basis (will withstand 1500VAC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI/ISA-82.01-1988 for the voltage rating specified.

Input-to-Input Isolation: The dual inputs of this model share common and are not isolated from each other.

Installation Category: Designed to operate in an Installation Category (Overvoltage Category) II environment per IEC 1010-1 (1990).

Radiated Field Immunity (RFI): Complies with IEC1000-4-3 Level 3 (10V/m, 80 to 1000MHz AM & 900MHz keyed) and European Norm EN50082-1.

Electromagnetic Interference Immunity (EMI): No relay trips will occur beyond ±0.25% of input span from setpoint under the influence of EMI from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient Immunity (EFT): Complies with IEC1000-4-4 Level 3 (2KV power; 1KV signal lines) and European Norm EN50082-1.

Surge Immunity: Complies with IEC1000-4-5 Level 3 (2.0KV) and European Norm EN50082-1.

Electrostatic Discharge (ESD) Immunity: Complies with IEC1000-4-2 Level 3 (8KV/4KV air/direct discharge) to the enclosure port and European Norm EN50082-1.

Radiated Emissions: Meets or exceeds European Norm EN50081-1 for class B equipment.

FIELD CONFIGURATION AND CONTROLS

Field program capability of key alarm functions (e.g. setpoint & deadband) is accomplished in the absence of a host computer with module push buttons and LED indicators. **Note:** The unit must be configured using the IntelliPack Configuration Software before alarm setpoints or deadband can be changed in the field.

Module Push Buttons (See Drawing 4501-631 for Location):

Mode - Used to change mode of field configuration.
Set - Used to accept input data during field calibration.
Reset 1 - Used to reset a latched alarm for relay 1.
Reset 2 - Used to reset a latched alarm for relay 2.

LED Indicators (See Drawing 4501-631 for Location):

Operating Mode

Run (Green) - Constant ON indicates power is applied and unit is operating normally. Flashing ON/OFF indicates unit is performing diagnostics (first second following power-up), or has failed diagnostics (after a few seconds).
Status (Yellow) - Flashing ON/OFF indicates an open sensor or broken RTD lead.
Relay 1 Alarm (Yellow) - Constant ON indicates an alarm condition for relay 1. During field configuration, this LED has a different function (see below).
Relay 2 Alarm (Yellow) - Constant ON indicates an alarm condition for relay 2. During field configuration, this LED has a different function (see below).

Field Configuration Mode

Run (Green) - Turned OFF in this mode.
Status (Yellow) - Blinks each time the Set button is pressed to capture an input signal in this mode.
Relay 1 Alarm (Yellow) - Constant ON or flashing ON/OFF indicates whether configuration parameter 1 or 2, respectively, of relay 1 is being programmed in this mode (see Table 5).
Relay 2 Alarm (Yellow) - Constant ON or flashing ON/OFF indicates whether configuration parameter 1 or 2, respectively, of relay 2 is being programmed in this mode (see Table 5).

HOST COMPUTER COMMUNICATION

Host Computer Communication: Configuration information is downloaded from the host computer through one of its EIA232 serial ports. This port must be connected to the module through an Acromag IntelliPack Serial Port Adapter, which serves as an isolated interface converter between EIA232 and the IntelliPack SPI port (standard RJ11 6-wire phone jack).
Baud Rate (EIA232): 19.2K baud.

SOFTWARE CONFIGURATION

Units are fully reprogrammable via the user-friendly Windows 95® or NT® IntelliPack Configuration Program (Model 5030-881). Reprogrammable non-volatile memory integrated within the microcontroller makes remote firmware calibration and configuration changes easy. A cable (5030-902) and converter (5030-913) are required to complete the interface (Software Interface Package 800C-SIP). See Drawing 4501-635.

The following alarm attributes are selectable via the IntelliPack Configuration Software. Applicable attributes will vary with respect to the alarm operating function (e.g. limit, on/off controller, deviation, window, peak/valley detection, rate-of-change, etc). Refer to IntelliPack Alarm Configuration Manual 8500-563 for a detailed explanation of these attributes and their application.

Input 1 & Input 2 Configuration

Input - Range: The alarm can be configured to accept any of the input types/ranges described in the Input Specifications using the IntelliPack Configuration Software.
Input - Temperature Units: Select °C, °F, or K units.
Input - RTD Wiring: The RTD wiring must be specified for proper lead-wire compensation. Alarm can be configured for two, three, or four-wire (Kelvin or compensation loop) RTD sensor wiring.
Input - Alarm Type: Select Limit Alarm, Window Alarm, On/Off Controller, Deviation Alarm, Peak/Valley Detector, or Rate-of-Change Alarm (see description in Alarm Configuration).
Input - Sensor Break: Signal detent for the detection of a failed sensor can be set to upscale or down-scale.
Input Calibration: The configuration software can be used to calibrate each input of this module and restore a module's original factory input calibration in case of miscalibration.

Alarm 1 & Alarm 2 Configuration

Alarm Operating Functions: The following gives a brief description of current available alarm operating functions for this model. Other modes are possible (consult the factory).

Limit Alarm: Limit alarms have only a single high or low setpoint applied to an input at a time. The relay will enter the alarm state when the user-defined high or low setpoint is exceeded for the specified amount of time. Relay remains in alarm until the input has retreated past the setpoint, plus any deadband, for the specified amount of time.
Window: Window alarms have both high and low setpoints on an input at a time. The relay will enter the alarm state when either the user-defined high or low setpoint is exceeded for the specified amount of time. Relay remains in alarm until the input has retreated past the setpoint, plus deadband, for the specified amount of time.
On/Off Controller: The relay will enter the alarm state when the "on" setpoint has been exceeded for the specified amount of time. Relay remains in alarm until the input signal has retreated past the "off" setpoint (deadband does not apply) for the specified amount of time. Note that latching relays are not applicable to On/Off Controllers.
Deviation (Both Inputs Required): The deviation alarm (positive, negative, or absolute) uses the difference between the inputs to generate an alarm condition. One input is selected to serve as the reference and the deviation of the other input is measured from this. Positive deviation is determined via (input1-input2), negative deviation via (input2-input1), and absolute deviation is determined via the absolute value of [input1-input2]. The relay will enter the alarm state when the deviation limit has been exceeded for the specified amount of time. The relay remains in the alarm state until the signal has retreated to within the deviation limit, plus any deadband, for the specified amount of time.

Peak/Valley Detection: An alarm condition is produced for a user defined peak (max) or valley (min) condition of the desired input signal. The peak/valley detection function will not activate until the input signal has exceeded the user-specified peak or valley start sensing level for the user-specified amount of time delay. Once the peak/valley function has been activated, the input is monitored to detect a retreat in the input by an amount specified as the deadband value. When this occurs, the relay will enter the alarm state (no delay applies). The relay remains in the alarm state until the signal has further retreated beyond a user specified deactivate value (no delay applies). Note that if the start value is greater than the deactivate value, then a peak condition will be detected. Otherwise, a valley detection will be made.

Rate-of-Change: The relay will enter the alarm state when the programmed rate-of-change threshold value is exceeded by the input signal's rate-of-change. The relay remains in the alarm state until the input signal's rate-of-change has retreated below a user specified dropout rate-of-change value. The input signal rate-of-change is calculated as a running average of 5 samples over a 1 second time interval for this model (this allows input transients to be filtered). The module always monitors the absolute rate of change in the input signal and will activate with either a positive or negative rate-of-change. The rate-of-change threshold and dropout values may be adjusted in the field via the module's push-buttons and LED's (units/second are selected during host computer configuration).

Alarm - Input: The input signal range to the alarm is the full range for the configured input type.

Alarm - Mode: Select a High or Low limit for the limit alarm function. The relay will trip on an increasing input signal for a high limit, and on a decreasing input signal for a low limit.

Alarm - Setpoint: High or low setpoints (plus deadband) may be assigned to each relay and are programmable over the entire input range. The relay will trip on an increasing signal for a high setpoint, and on a decreasing signal for a low setpoint. The relay will enter the alarm state when either the user-defined high or low setpoint is exceeded for the specified amount of time (this allows input transients to be filtered). Relay remains in the alarm state until the input signal has retreated past the defined setpoint, plus any deadband, for the specified amount of time.

Alarm - Deadband: Deadband is associated with each setpoint and is programmable over the entire input range. Deadband determines the amount the input signal has to return into the "normal" operating range before the relay contacts will transfer out of the "alarm" state. Deadband is normally used to eliminate false trips or alarm "chatter" caused by fluctuations in the input near the alarm point. Note that deadband may also apply to latched alarms. If the alarm is latching, it is recommended that the deadband be set to a minimum.

IMPORTANT: Noise and/or jitter on the input signal has the effect of reducing (narrowing) the deadband and may produce contact chatter. Another long term effect of contact chatter is a reduction in the life of mechanical relay contacts. To reduce this undesired effect, increase the deadband setting.

Alarm Indicators: One yellow LED per relay provides a visual status indication of when a relay is in alarm.

Relay - Time Delay: Programmable from 0 milliseconds to 4 seconds in 200ms increments for this model (used to help filter input transients and avoid nuisance alarming). A minimum delay of 200ms is recommended for increased noise immunity and conformance to applicable safety standards.

Relay - Operating Mode: User configurable for "failsafe" operation (relay deenergized in alarm state), or non-failsafe operation (relay energized in alarm state). Failsafe mode provides the same contact closure for alarm states as for power loss, while non-failsafe mode uses alarm contact closure opposite to power loss conditions.

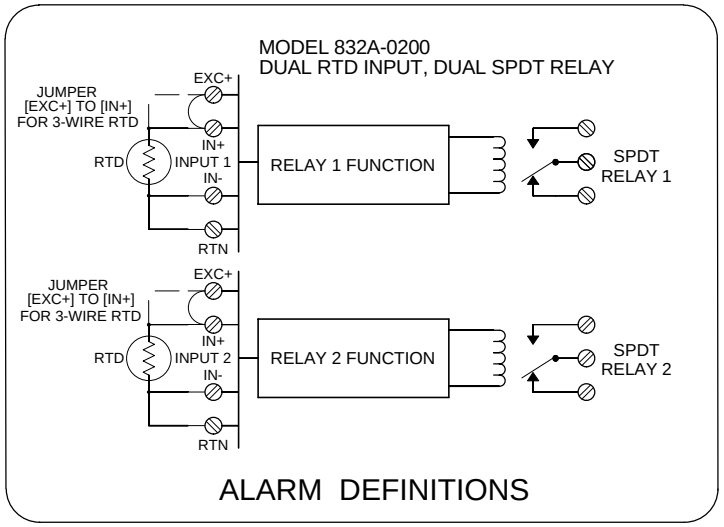
Relay - Reset: Relays may be configured to automatically reset when the inputs retreat past their setpoints and deadband, or relays may latch into their alarm state. One push-button reset switch per relay is located on the front of the module and is used to exit the latched state (this may also be accomplished under software control). A latched relay cannot be reset until its input signal has returned into its normal operating range with deadband applied and after the relay time delay. Note that when the input returns to, or leaves the normal operating range, the relay and its LED will transfer after the relay time delay has expired. That is, time delay applies to both activating and deactivating the relay.

Other IntelliPack Configuration Software Capabilities

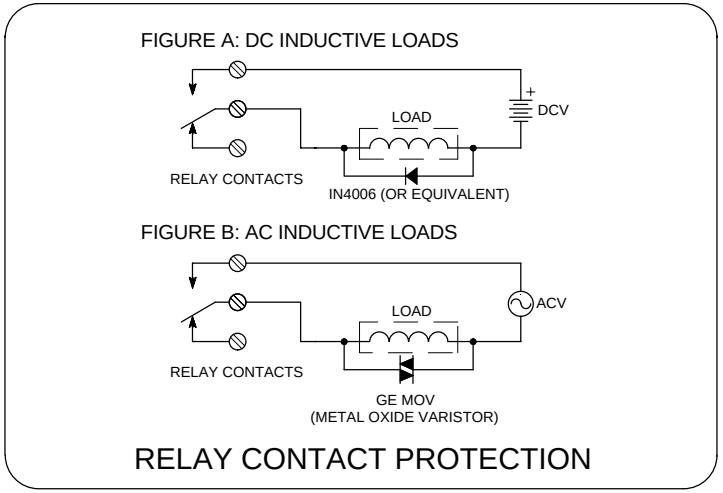
In addition to configuring all features of the module described above, the IntelliPack Configuration Software includes additional capabilities for testing and control of this module as follows:

- Monitors the input signal values and alarm status and allows polling to be turned on or off.
- Allows a configuration to be uploaded or downloaded to/from the module. Also provides a means to rewrite a module's firmware if the microcontroller is replaced or a module's functionality is updated.
- Provides controls to separately calibrate each input circuit. It also provides controls to restore the original factory input calibration in case of error.
- Provides controls to reset a module.
- Provides controls to reset a latched alarm (same effect as a push-button alarm reset at the module).
- Allows optional user documentation to be written to the module. Documentation fields are provided for tag number, comment, configured by, location, and identification information. This information can also be uploaded from the module and printed via this software.
- Allows a module's complete configuration to be printed in an easy to read, one or two page format, including user documentation.

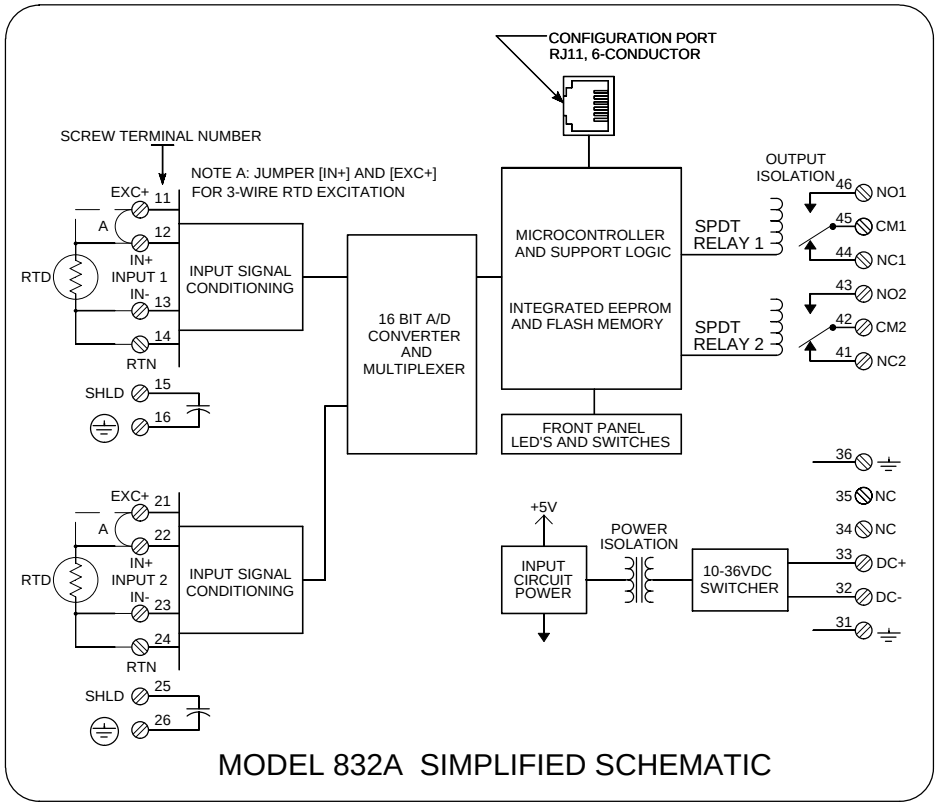
For complete information on the IntelliPack Configuration Software, refer to Alarm Configuration Manual 8500-563.



ALARM DEFINITIONS



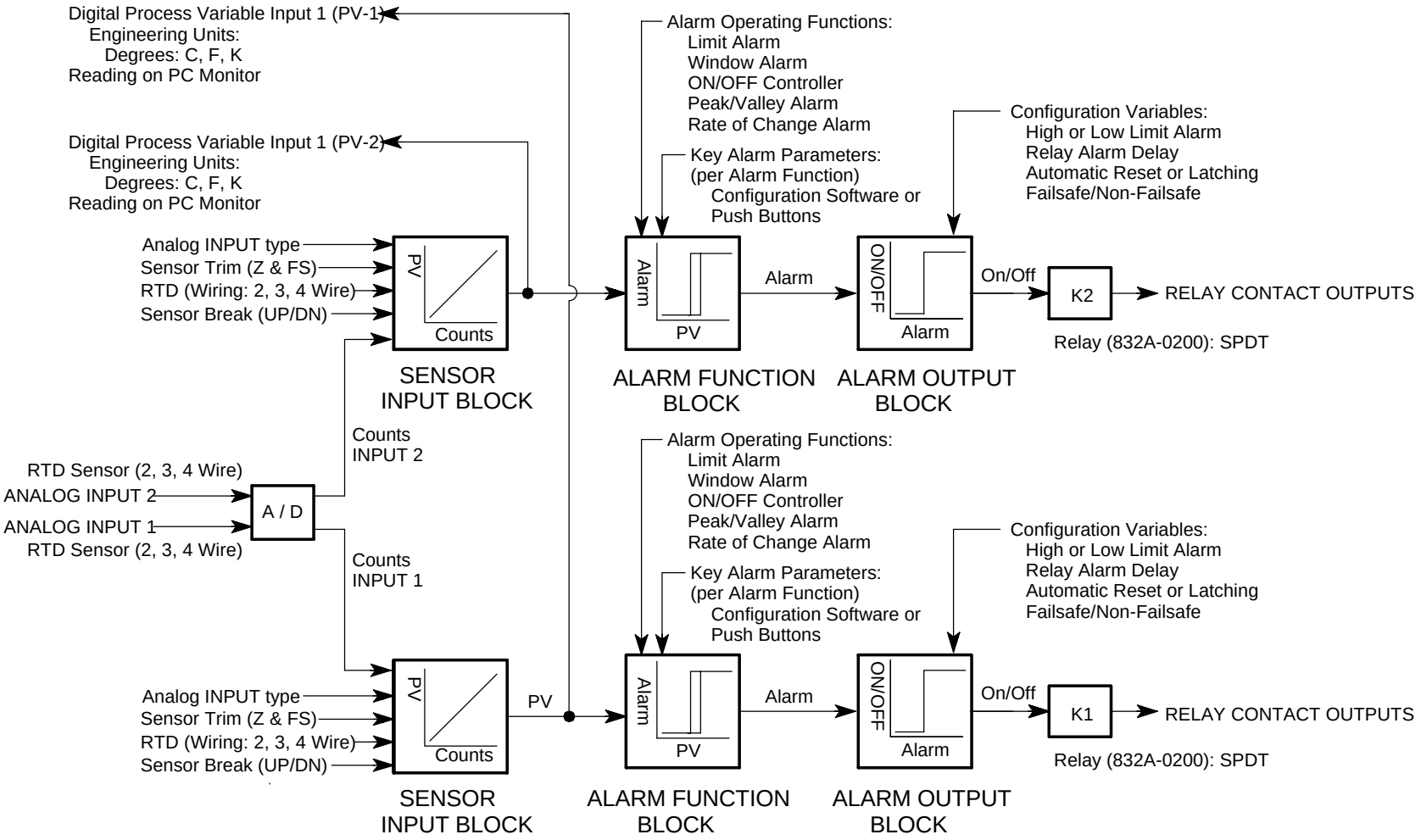
RELAY CONTACT PROTECTION



MODEL 832A SIMPLIFIED SCHEMATIC

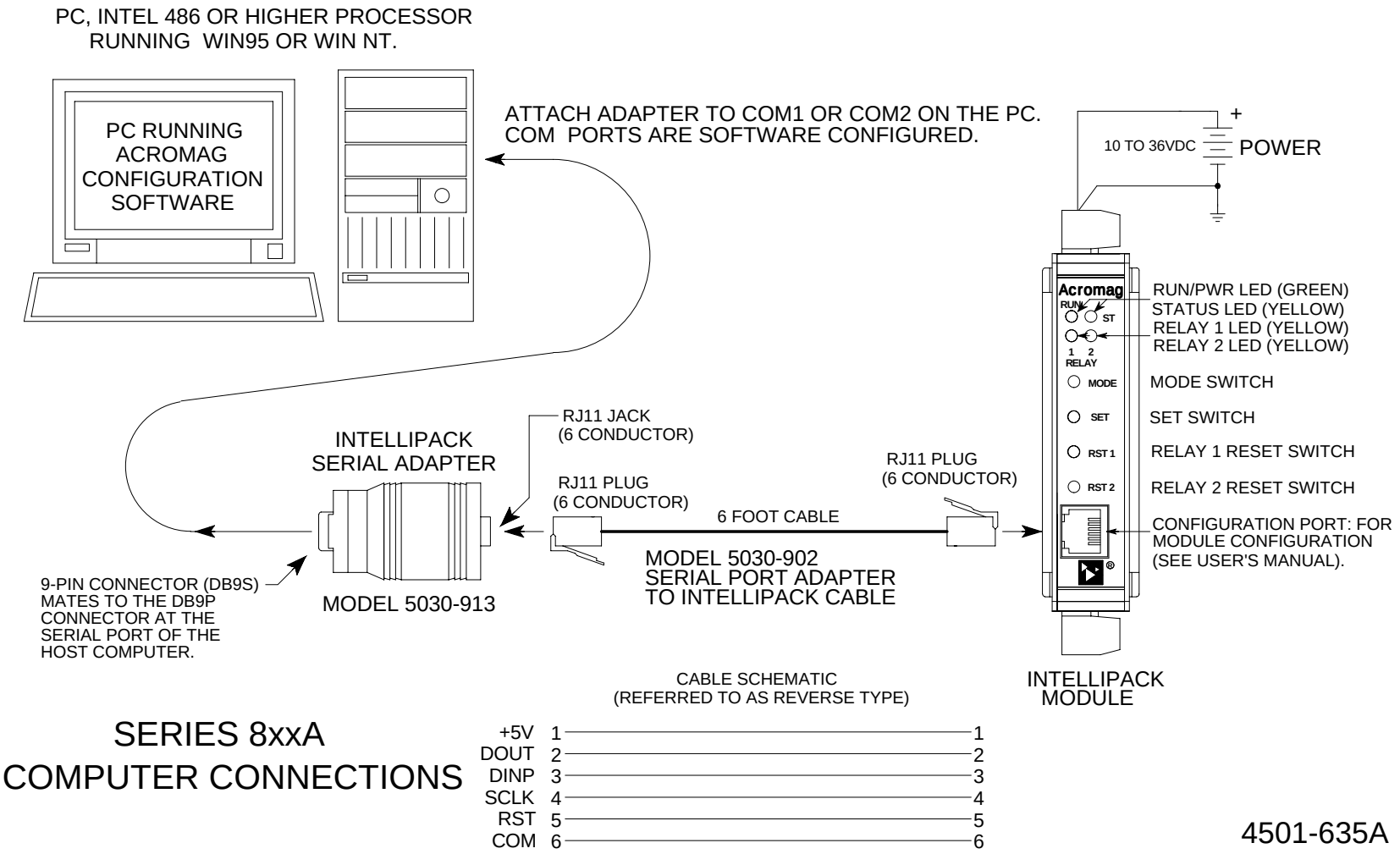
MODEL 832A
SIMPLIFIED SCHEMATIC AND
RELAY CONTACT PROTECTION

4501-627A



MODEL: 832A-0200
ALARM FUNCTIONAL BLOCK DIAGRAM

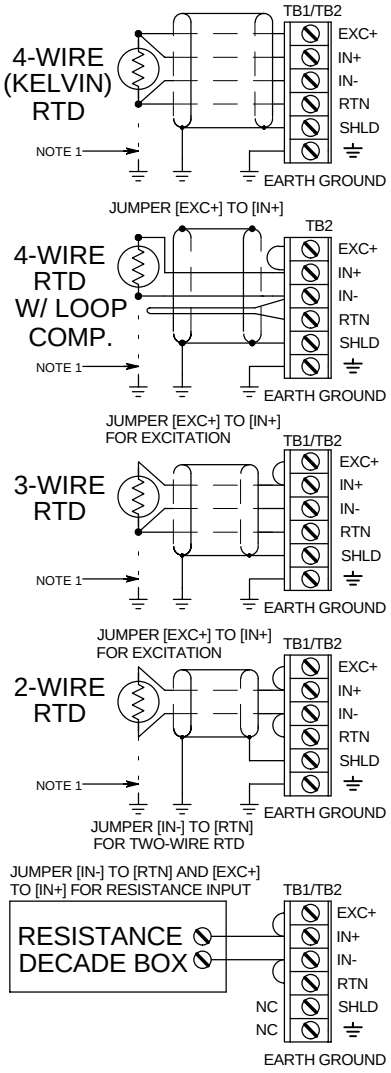
4501-694A



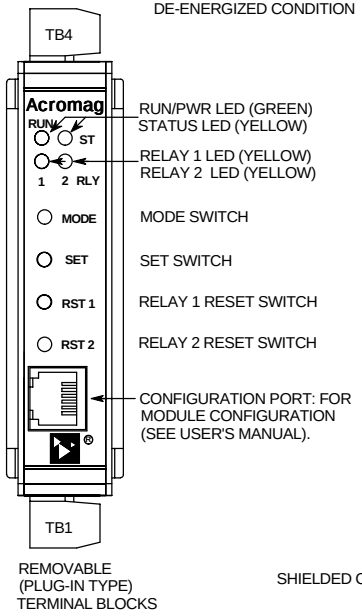
SERIES 8xxA
COMPUTER CONNECTIONS

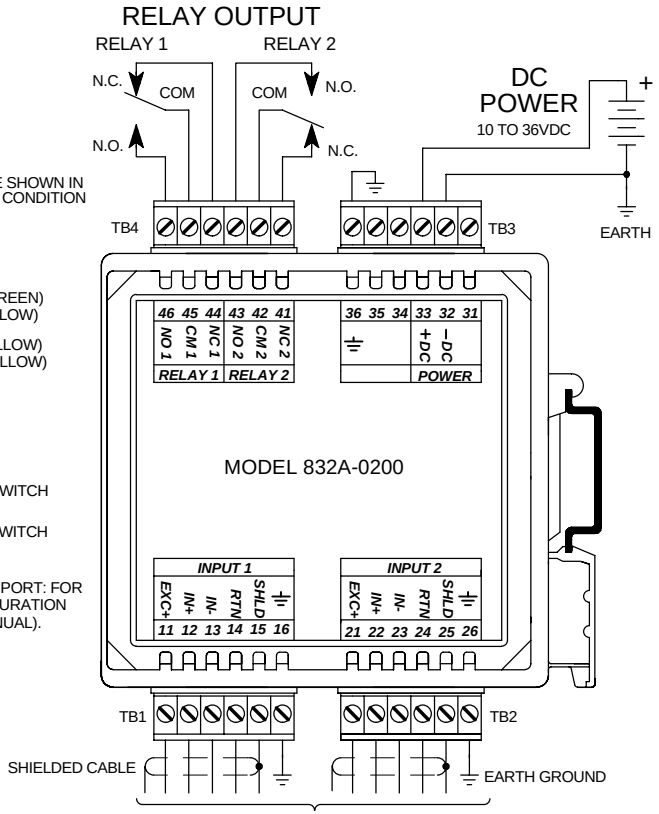
4501-635A

MODEL 832A-0200
ELECTRICAL CONNECTIONS



NOTE 1: THIS GROUND CONNECTION IS RECOMMENDED FOR BEST RESULTS. DUAL INPUT MODELS SHOULD HAVE ONLY ONE INPUT GROUNDED AT A TIME. CONNECTING A SECOND INPUT TO GROUND WOULD GENERATE A GROUND LOOP AND CAUSE MEASUREMENT ERRORS. IF SENSORS ARE INHERENTLY CONNECTED TO GROUND, USE CAUTION AND AVOID MAKING ADDITIONAL GROUND CONNECTIONS WHICH COULD GENERATE GROUND LOOPS AND MEASUREMENT ERROR.



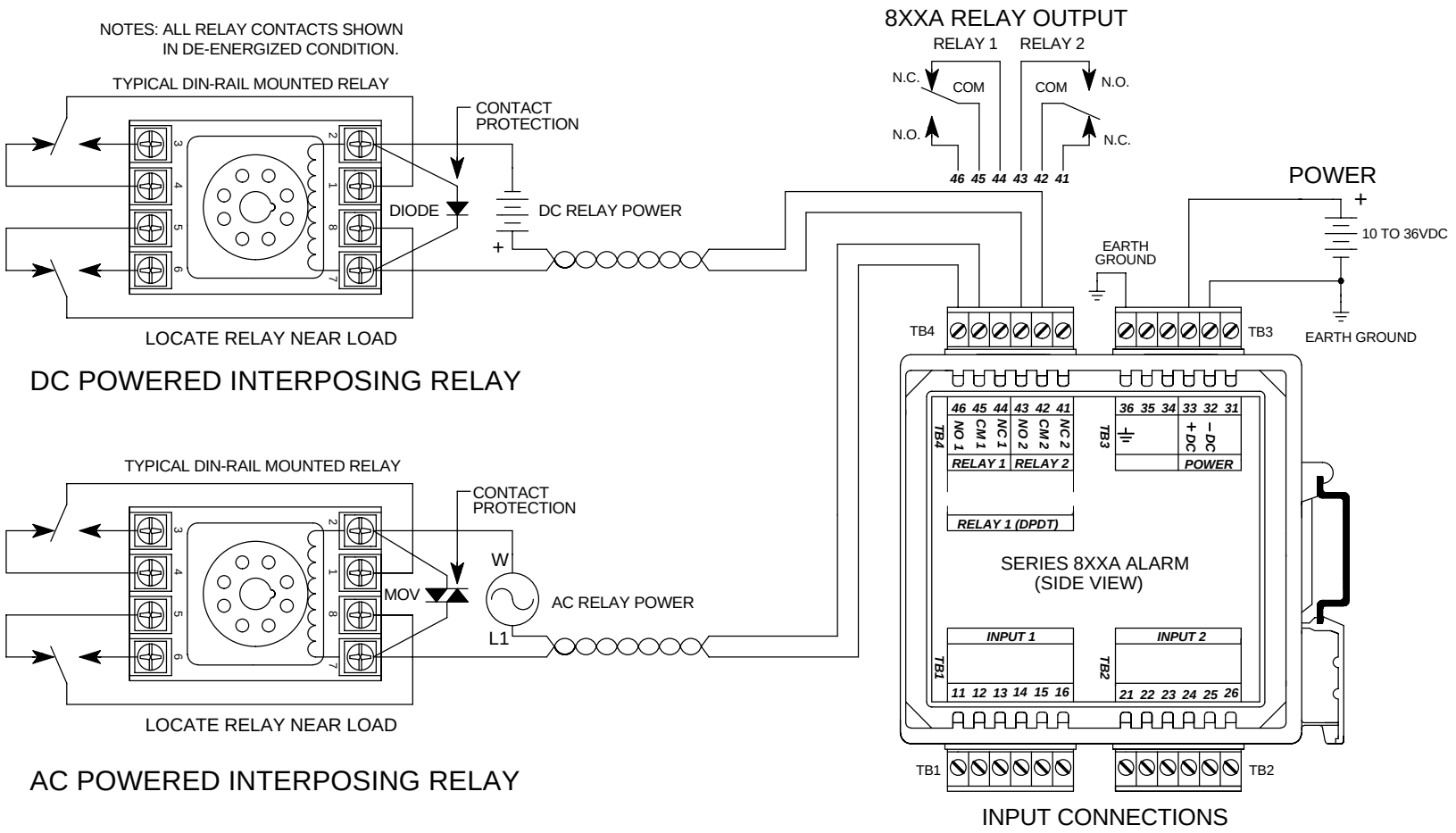


INPUT CONNECTIONS
(SEE INPUT CONNECTIONS AT LEFT)

WARNING:
FOR COMPLIANCE TO APPLICABLE SAFETY AND PERFORMANCE STANDARDS, THE USE OF SHIELDED CABLE IS RECOMMENDED AS SHOWN. ADDITIONALLY, THE APPLICATION OF EARTH GROUND MUST BE IN PLACE AS SHOWN IN THIS DRAWING. FAILURE TO ADHERE TO SOUND WIRING AND GROUNDING PRACTICES MAY COMPROMISE SAFETY AND PERFORMANCE.

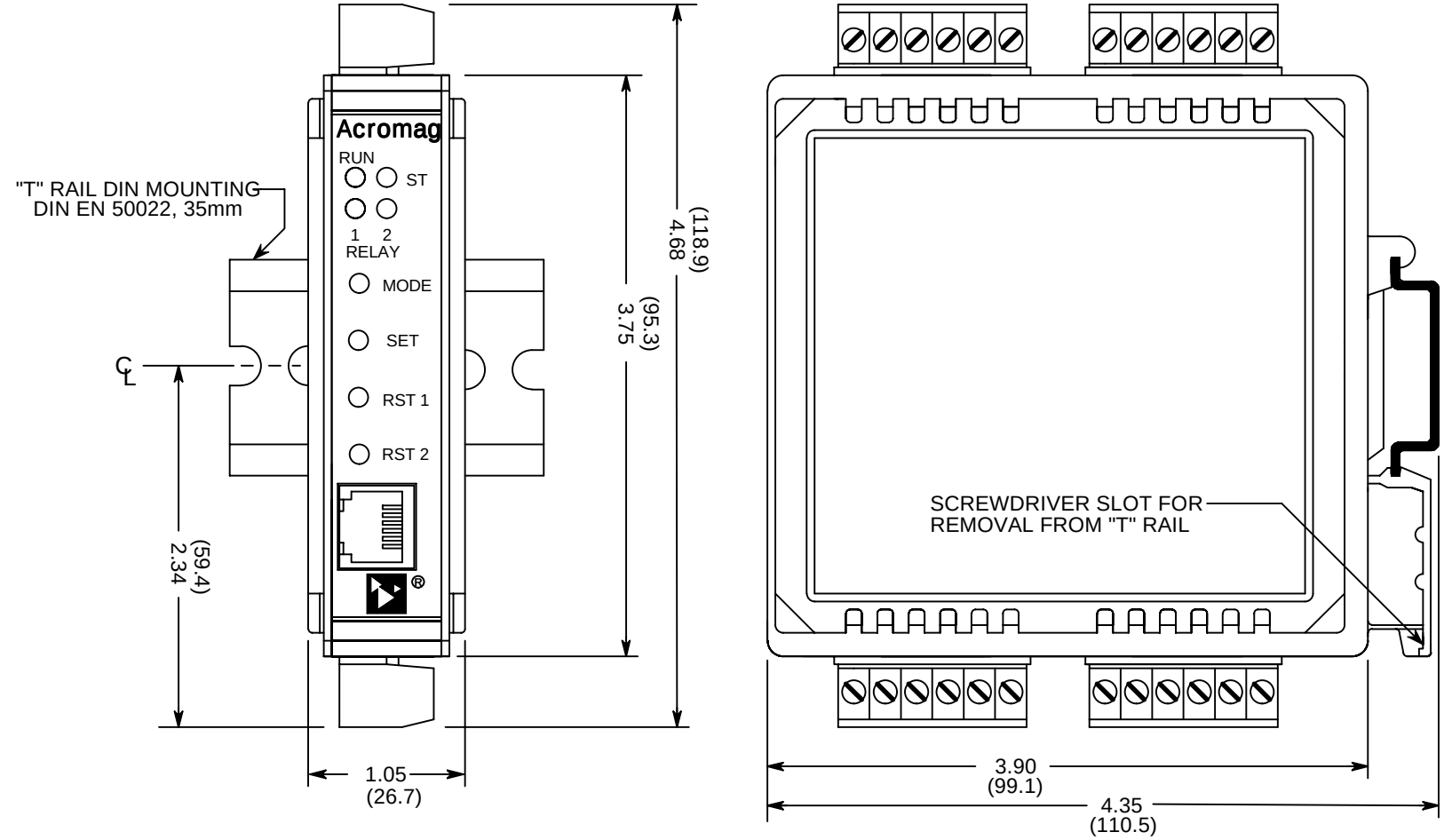
SAFETY GUIDELINES MAY REQUIRE THAT THIS DEVICE BE HOUSED IN AN APPROVED METAL ENCLOSURE OR SUB-SYSTEM, PARTICULARLY FOR APPLICATIONS WITH VOLTAGES GREATER THAN OR EQUAL TO 75VDC/50VAC.

4501-638A



SERIES 8xxA INTERPOSING RELAY CONNECTIONS

4501-634A



NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)

INTELLIPACK ENCLOSURE DIMENSIONS

4501-631A